Introduction & Problem Statement

We are in year two of the Volga River Project. Last year's 7th grade students tested the water quality for turbidity, nitrates, pH, dissolved oxygen, and temperature. In 2008-09 the water was tested four times in November. This year we decided to repeat the same test every month starting in November.

Why Test The Volga River?

- Volga River runs through the middle of our town
- Many children play in the river.
- Many people fish in the river.

Why Test Turbidity?

- Shade limits plant growth – less plants less oxygen.
- Cloudy water absorbs more sunlight raising temperature.
- Congestion clogs respiration of animals.

Why test for Nitrates?

- Can cause Methemoglobinemia or Blue Baby Syndrome.
- Indicator of other problems such as bacteria or pesticides.
- 221 ppm is harmful even toxic.
- 10 ppm is not considered safe to drink.

Why test Oxygen levels?

- Low levels indicate an excessive demand on oxygen in the system.

- Pollutants such as sewage or agriculture runoff result in a build up of organic matter and the consumption of oxygen by microbile decomposers.

- Most organisms cannot exit at dissolved oxygen levels less than 3.0 mg/L.

- Dissolved oxygen levels under 5 mg/L puts stress on Aquatic life.

Why test pH levels?

- Fresh water fish thrive on a pH range around 5.5 – 7.5.
- pH determines solubility.
- Metals tend to be more toxic at lower pH because they are more soluble.
- According to the EPA, a pH of 5 or lower has been found to be directly toxic to fish.

Why test for Temperature?

- As water temperature increases plant growth increases.
- When plants die, decomposers consume oxygen.
- Increasing water temperature raises the metabolic rate of organisms which increase the demand for oxygen.

Turbidity Globe Protocol

Materials needed

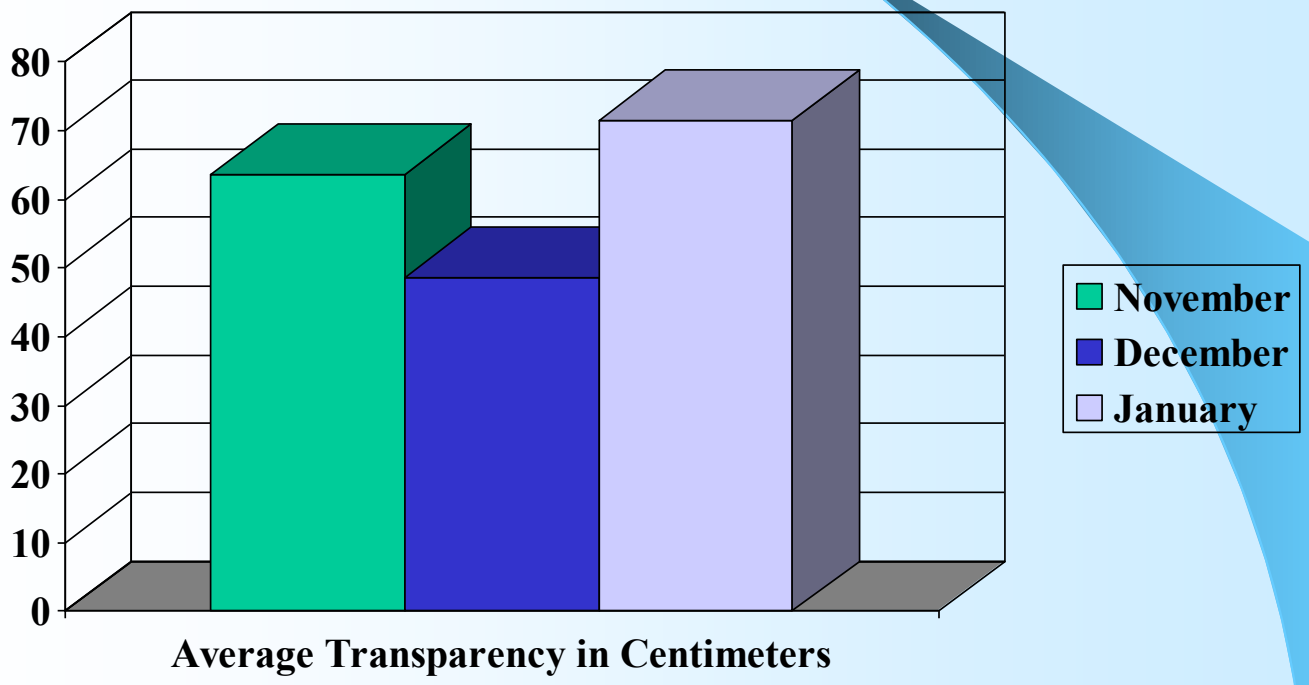
- Data sheet, clip board and pen
- Turbidity Globe Protocol Field Guide
- Cloud cover guide
- Transparency tube
- Cup for pouring water into tube
- Latex gloves
- Bucket

Turbidity Globe Protocol

In the Field

1. Record the cloud cover.
2. Put on gloves.
3. Collect water sample.
4. Stand with your back to the sun so that the tube is shaded.
5. Pour sample water slowly into tube using a cup.
6. Look straight down into the tube.
7. Stop adding water when you cannot see the pattern at the bottom of the tube.
8. Record the depth of water in the tube on the data sheet.
9. Repeat the measurement two more times.

Turbidity BAR GRAPH



Nitrate Globe Protocol

Materials Needed

- Data Sheet
- Goggles
- Nitrates Teat Kit
- Distilled Water
- Latex Gloves
- Surgical Mask
- Clock or Watch
- Chemical waste bottle

Nitrates: In the Field

1. Fill out data sheet.
2. Put on gloves.
3. Use the low range test.
4. Fill sampling bottle with sample water.
5. Fill one test tube to the lower line (5mL) with sample water.
6. Dilute to second line with mixed acid reagent. Cap and mix.
7. Wait 2 minutes.
8. Put on a surgical mask.
9. Use the 0.1g spoon to add one level measure of nitrate reducing reagent.
10. Cap tube. Invert tube slowly and completely 30 times in one minute to insure complete mixing.
11. Wait 10 minutes.
12. Insert tube into axial reader.
13. Match color.
14. Record value on data sheet as ppm nitrate-nitrogen.
15. Empty into waste bottle.
16. Repeat 2 more times.
17. Calculate the average.

Nitrate Results

November Average: 0

December Average: .06

January Average: .06

Low nitrate level: 0 to 1.0ppm

High nitrate level: above 1.0 to 10ppm

Above 10ppm not safe to drink.

Dissolved Oxygen Protocol

Materials Needed

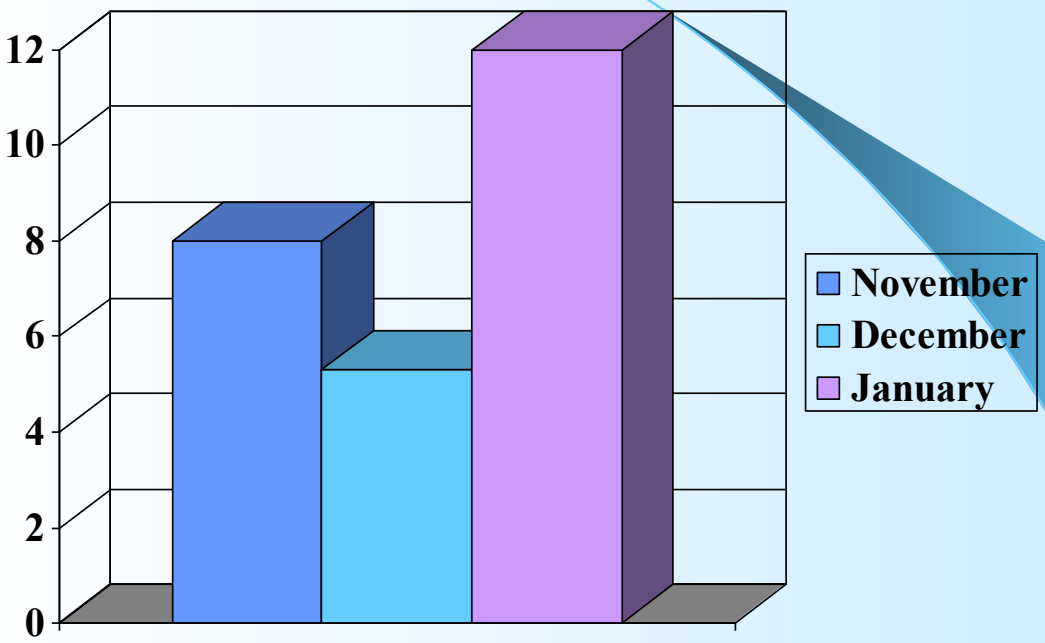
- Data Sheet
- Dissolved Oxygen Protocol Field Guide
- Dissolved Oxygen Protocol Kit
- Dissolved Oxygen Protocol Field Guide
- Latex Gloves
- Safety goggles
- Waste bottle with lid
- Distilled water
- Watch or timer
- Pen
- Clip board

Dissolved Oxygen Protocol

In the Field

1. Fill sample cup to the 25 mL mark with your sample.
2. Place the CHEMet ampoule in the sample cup.
3. Snap the tip by pressing the ampoule against the side of the cup.
4. The ampoule will fill, leaving a small bubble to facilitate mixing.
5. Invert several times.
6. Wait 2 minutes.
7. Hold the comparator in a nearly horizontal position and place the CHEMet ampoule between the color standards moving it from left to right to get the best color match.
8. Record number on data sheet.

Dissolved Oxygen Graph



pH Globe Protocol

Materials Needed

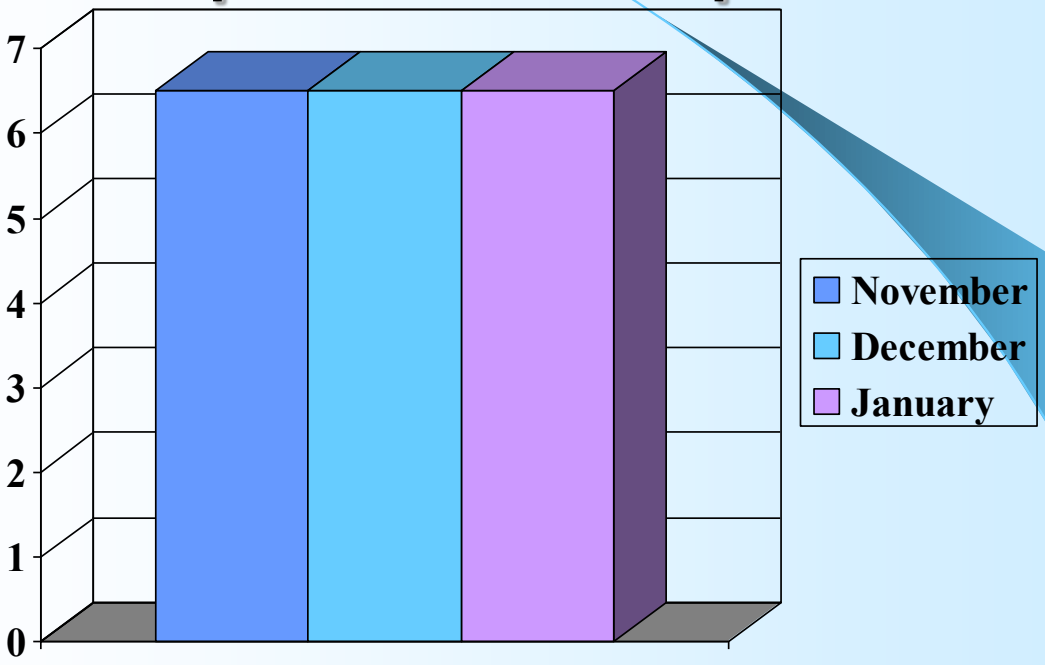
- Data sheet
- pH paper
- 3 beakers
- Latex gloves
- pH meters
- Buffer solution 4.0, 7.0, and 10.0
- Clip board
- Pens

pH

In the Field

1. Fill in data sheet
2. Put on latex gloves
3. Rinse beakers with sample water 3 times
4. Fill the beaker with sample water
5. Put pH paper in beaker
6. Match paper with color key
7. Record your pH paper on data sheet
8. Repeat steps 3-7 twice
9. Find the average of the 3 observations
10. Discard used pH paper and latex gloves

pH Bar Graph



Temperature Globe Protocol

Materials needed

- Data Sheet
- Water temperature Protocol Field Guide
- Alcohol filled thermometer with attached string and rubber band
- Latex gloves
- Watch

Temperature Globe Protocol

In the Field

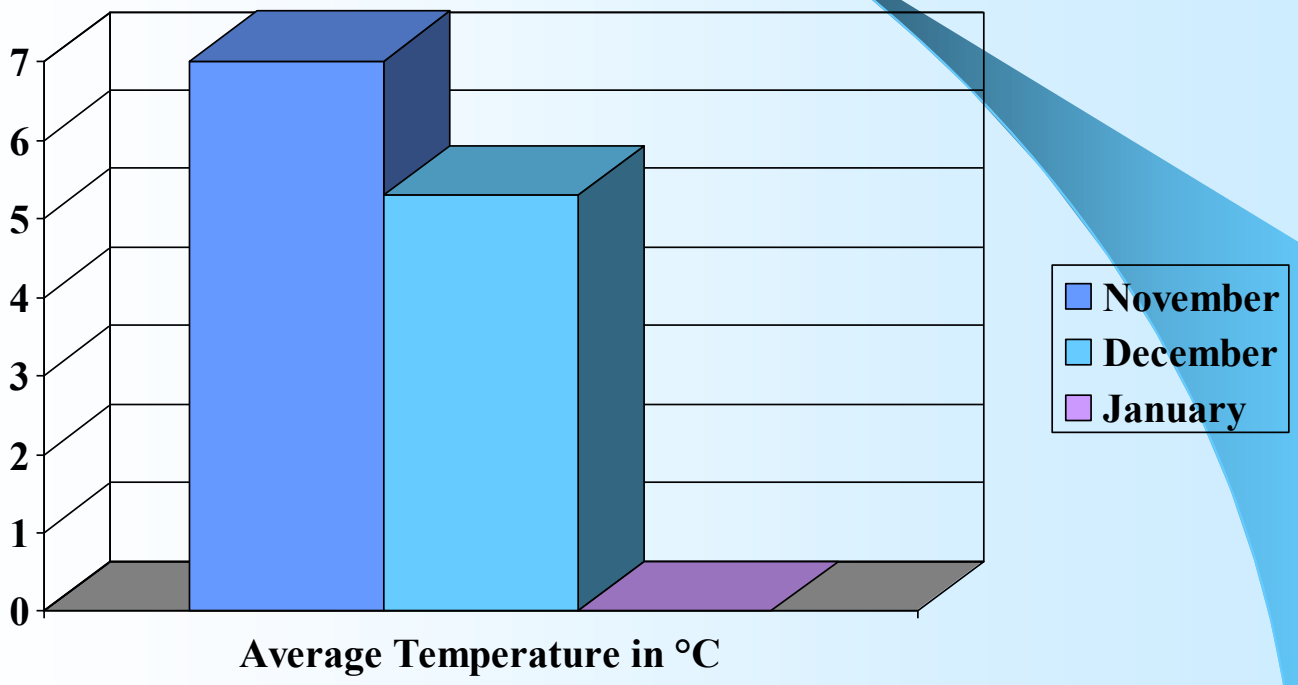
1. Fill out data sheet
2. Put on gloves
3. Check the thermometer for air bubbles
4. Put the thermometer to a depth of 10cm for 3min

Temperature Globe Protocol

In the Field

1. Fill out data sheet
2. Put on gloves
3. Check the thermometer for air bubbles
4. Put the thermometer to a depth of 10cm for 3min
5. Read the thermometer without removing the bulb of the thermometer from the water and record
6. Repeat steps 4 and 5 two more times and record
7. Calculate the average
8. All temperatures should be within 1.0 C of the average. If not repeat measurements

Temperature



GPS

42.77860 North 41.88061 West Elevation: 331 meters	42.77861 North 091.88063 West Elevation: 332 meters	42.77861 North 091.88062 West Elevation: 336 meters
42.77862 North 091.88062 West Elevation: 336 meters	42.77862 North 091.88062 West Elevation: 334 meters	MUC 71

Results of the Volga River 2008-09

Turbidity Average was 49.8 which is in the excellent range.	**Nitrates** Average was 0 which is in the excellent range.	**Dissolved Oxygen** Average was 7.2 which is in the fair to good range for most animals.
pH Average was 7.2 which is in the excellent range	**Temperature** The drop in temperature was in the range in which was consistent with what you would expect for this time of year.	**Conclusion** The Volga River in Maynard is safe to swim and play in.

Results of the Volga River 2009-10

Turbidity Average was 61.3 which is in the excellent range. An increase of 13.9 cm.	**Nitrates** Average was 0.04 which is in the excellent range.	**Dissolved Oxygen** Average was 8.6ppm which is in the good range. An increase of 1.4ppm.
pH Average was 6.5 which is in the excellent range.Last year the average in November was 7.2, also in the excellent range.	**Temperature** The drop in temperature was in the range in which was consistent with what you would expect for this time of year.	**Conclusion** Our two year study of The Volga River in Maynard has shown that the water is safe to swim and play in.